MRI Protocols Comparison of In-Vivo Spinal Cord Imaging of the Rats for Segmentation Purposes

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***Abstract*- We are developing a three-dimensional (3D) model of the rat spinal cord to act as a reliable tool for investigating mechanisms of spinal injury. Segmentation and meshing, by which the spinal geometry is extracted into a model, requires both considerably clear boundaries and high-contrast representation of the cord components: white matter, grey matter, meninges, CSF and IVD. Unfortunately, despite the advancement of MRI technology, obtaining high-resolution and high-contrast spinal cord of the rat is not an easy task; tedious protocols set up are required. This work comparedtwoprotocols that are commonly used for in-vivo MRI acquisitions; FLASH (T1 weighted) and TurboRare(T2 weighted). The software packages MicroDICOM and Mimics were used to assess the outcome of each protocol. As further comparison, we also examined ex-vivo datasets obtaining with MSME (T2 and proton density weighted) acquisition. The assessment was made based on the clarity of canny edgecontrast detection and the amount of unintended objects adjacent to the spinal cord components on the 3D model. We found that compared to TurboRare (T2 weighted), FLASH (T1 weighted) visually produced higher contrast between white and grey matter. This visual assessment was confirmed by the canny edge boundary detection on MicroDICOM. On Mimics, this difference was not detectable. Although the amount of unintended structures of the 3D modelof FLASH (T1 weighted) acquisitions less than that of the TurboRare (T2 weighted), it was more likely due to the signal uniformity rather than the effect of acquisition selection. Additionally, since this work only involved 3 datasets, whereby the statistical validation is not sufficient, we could not suggesta conclusive finding. However, this work is important as the basis further MRI protocol comparison studies.**

***Keywords*—MRI, T1 weighted, T2 weighted, spinal cord, grey matter, white matter.**